CLAIMS

I claim:

1. A method of decoding quantized and unquantized wanted data symbols from received signal samples, comprising:

processing a group of currently received signal samples to determine a corresponding current set of unquantized wanted data symbols and an interfering waveform representative of a sum of other unwanted data symbols by subtracting an amount of a previously decoded set of quantized wanted symbols and a previously determined interfering waveform; and

quantizing said determined current set of unquantized wanted symbols to obtain corresponding quantized symbols.

2. The method of claim 1 wherein processing a group of currently received signal samples further comprises determining a set of channel coefficients characterizing multipath propagation.

3. The method of claim 2 wherein processing a group of currently received signal samples further comprises filtering said received signal samples using a filter based on said channel coefficients.

4. The method of claim 3 wherein said filter comprises a time-reversed conjugate channel filter.

5. The method of claim 1 wherein said current set of unquantized wanted symbols ~~includes~~ comprises only one wanted symbol.

6. The method of claim 5 wherein processing a group of currently received signal samples comprises combining a pair of successively received signal samples in a first combining way to obtain said current unquantized symbol and combining the same pair of samples in a second combining way to obtain a value of said interfering waveform.

7. The method of claim 6 wherein said first and second combining ways are orthogonal combining ways.

8. The method of claim 6 wherein said first and second combining ways comprise multiplying said received signal sample pairs by a conjugate of a pair of complex spreading code values.

9. The method of claim 2 wherein said channel coefficients are determined by correlating said received signal samples with known ones of said data symbols.

10. The method of claim 9 wherein said known symbols are known by both a transmitter and a receiver.

11. The method of claim 9 wherein said known symbols ~~include~~ comprises previously decoded symbols.

12. The method of claim 11 wherein said known symbols ~~include~~ comprises previously decoded symbols and using an error correction decoder.

13. The method of claim 1 further comprising:

hypothesizing a set of said quantized wanted symbols not yet decoded;

subtracting interference caused by said not yet decoded wanted symbols from said signal samples; and

using a Viterbi Maximum Likelihood Sequence Estimator to determine a sequence of hypothesized quantized data symbols having a smallest measure of quantizing error between the unquantized symbols and the quantized symbols.

14. A method of decoding Orthogonal Sequency Division Multiplexed symbols from signal samples received through a multipath channel, comprising:

filtering the received signal samples using a filter based on multipath channel coefficients;

grouping the filtered signal samples into vectors of N signal samples;

computing a first and a second N x N complex matrix based on multipath channel coefficients and a set of orthogonal codes used for said Orthogonal Sequency Division Multiplexed symbols;

multiplying a previously decoded and quantized set of symbols by said second matrix and combining it with a product of said first matrix with a current group of N filtered signal samples to obtain a current set of unquantized decoded symbols; and

quantizing said current set of unquantized symbols to obtain a current decoded and quantized set of symbols.

15. The method of claim 14 wherein said previously decoded and quantized set of symbols are further processed using an error correction decoder to improve decoding reliability.

16. The method of claim 15 wherein said previously decoded and quantized set of symbols are the result of processing the corresponding set of unquantized symbols using an error correction decoder.

17. A method of decoding Orthogonal Sequency Division Multiplexed symbols from signal samples received through a multipath channel, comprising:

prefiltering the received signal samples using a prefilter based on multipath channel coefficients;

grouping the prefiltered signal samples into vectors of N signal samples;

computing a series of N x N complex matrices ~~including~~ comprising at least a first and a second matrix and a final matrix based on said multipath channel coefficients and a set of orthogonal codes used for said Orthogonal Sequency Division Multiplexed symbols;

multiplying a current one of said N-sample vectors by a corresponding one of said at least first and second matrices and sample vectors received successively later in time by successive ones of said matrices and combining the products and further combining with the product of a previously decoded and quantized set of symbols by said final matrix to obtain a current set of unquantized decoded symbols; and

quantizing said current set of unquantized symbols to obtain a current decoded and quantized set of symbols.

18. The method of claim 17 wherein said previously decoded and quantized set of symbols are further processed using an error correction decoder to improve decoding reliability.

19. The method of claim 18 wherein said previously decoded and quantized set of symbols are the result of processing the corresponding set of unquantized symbols using an error correction decoder.

20. A method of decoding overlapping signals of successively lower datarate comprising:

decoding signals of a highest datarate first and producing a residual waveform corresponding to a sum of all signals of lower datarate;

decoding signals of a next successively lower datarate by reprocessing said residual waveform and producing an updated residual waveform corresponding to a sum of all remaining signals of lower datarate than the signals of the next successively lower datarate; and

repeating decoding signals of a next successively lower datarate by reprocessing said residual waveform and producing an updated residual waveform corresponding to a sum of all remaining signals of lower datarate than the signals of the next successively lower datarate, until all desired signals are decoded.

21. The method of claim 20 wherein decoding signals of a highest datarate comprises compensating for interference from signals of a lower datarate.

22. The method of claim 20 wherein decoding of signals comprises compensating for Intersymbol Interference due to multipath propagation.

23. A method for decoding overlapping data symbols modulated with mutually orthogonal spreading codes in which some of said symbols are known a-priori, comprising:

receiving blocks of signal samples through a channel suffering from multipath propagation, a number of signal samples in a block being equal to a length of said orthogonal spreading codes;

subtracting from said signal samples intersymbol interference (ISI) related to previously decoded symbols and to said known symbols to produce corresponding blocks of ISI-compensated signal samples; and

processing said ISI-compensated sample blocks to obtain a least-squares solution for the remaining, unknown data symbols each quantized to a nearest symbol in the alphabet of symbols with minimum mean-square quantizing error.

24. The method of claim 23 wherein said subtracted intersymbol interference is based on channel coefficients that describe said multipath propagation.

25. The method of claim 24 wherein said channel coefficients are estimated by correlating said received signal samples with said known symbols.

26. A receiver for decoding quantized and unquantized wanted data symbols from received signal samples, comprising:

a control adapted to process a group of currently received signal samples to determine a corresponding current set of unquantized wanted data symbols and an interfering waveform representative of a sum of other unwanted data symbols by subtracting an amount of a previously decoded set of quantized wanted symbols and a previously determined interfering waveform; and

a quantizer adapted to quantize said determined current set of unquantized wanted symbols to obtain corresponding quantized symbols.

27. The receiver of claim 26 further comprising a channel estimator for determining a set of channel coefficients characterizing multipath propagation.

28. The receiver of claim 27 further comprising a filter for filtering said received signal samples based on said channel coefficients.

29. The receiver of claim 28 wherein said filter comprises a time-reversed conjugate channel filter.

30. The receiver of claim 26 wherein said current set of unquantized wanted symbols includes only one wanted symbol.

31. The receiver of claim 30 wherein said control combines a pair of successively received signal samples in a first combining way to obtain said current unquantized symbol and combines the same pair of samples in a second combining way to obtain a value of said interfering waveform.

32. The receiver of claim 31 wherein said first and second combining ways are orthogonal combining ways.

33. The receiver of claim 31 wherein said first and second combining ways comprise multiplying said received signal sample pairs by a conjugate of a pair of complex spreading code values.

34. The receiver of claim 27 wherein said channel estimator determines said channel coefficients by correlating said received signal samples with known ones of said data symbols.

35. The receiver of claim 34 wherein said known symbols include previously decoded symbols.

36. A mobile terminal used in a mobile communications system decoding overlapping data symbols modulated with mutually orthogonal spreading codes in which some of said symbols are known a-priori, comprising:

a receiver receiving blocks of signal samples through a channel suffering from multipath propagation, a number of signal samples in a block being equal to a length of said orthogonal spreading codes;

a control subtracting from said signal samples intersymbol interference (ISI) related to previously decoded symbols and to said known symbols to produce corresponding blocks of ISI-compensated signal samples; and

a quantizer processing said ISI-compensated sample blocks to obtain a least-squares solution for the remaining, unknown data symbols each quantized to a nearest symbol in the alphabet of symbols with minimum mean-square quantizing error.

37. The mobile terminal of claim 36 wherein said subtracted intersymbol interference is based on channel coefficients that describe said multipath propagation.

38. The mobile terminal of claim 37 wherein said channel coefficients are estimated by correlating said received signal samples with said known symbols.

39. A base station used in a mobile communications system decoding overlapping data symbols modulated with mutually orthogonal spreading codes in which some of said symbols are known a-priori, comprising:

a receiver receiving blocks of signal samples through a channel suffering from multipath propagation, a number of signal samples in a block being equal to a length of said orthogonal spreading codes;

a control subtracting from said signal samples intersymbol interference (ISI) related to previously decoded symbols and to said known symbols to produce corresponding blocks of ISI-compensated signal samples; and

a quantizer processing said ISI-compensated sample blocks to obtain a least-squares solution for the remaining, unknown data symbols each quantized to a nearest symbol in the alphabet of symbols with minimum mean-square quantizing error.

40. The ~~mobile terminal~~ base station of claim 39 wherein said subtracted intersymbol interference is based on channel coefficients that describe said multipath propagation.

41. The ~~mobile terminal~~ base station of claim 40 wherein said channel coefficients are estimated by correlating said received signal samples with said known symbols.

42. A mobile communications system reducing interference between transmissions of wanted signals and unwanted interfering signals, comprising:

a receiver comprising a control adapted to process a group of currently received signal samples to determine a corresponding current set of unquantized wanted data symbols and an interfering waveform representative of a sum of other unwanted interfering data symbols by subtracting an amount of a previously decoded set of quantized wanted symbols and a previously determined interfering waveform; and a quantizer adapted to quantize said determined current set of unquantized wanted symbols to obtain corresponding quantized symbols.

43. The mobile communications system of claim 42 wherein said receiver further comprises a channel estimator for determining a set of channel coefficients characterizing multipath propagation.

44. The mobile communications system of claim 43 wherein said receiver further comprises a filter for filtering said received signal samples based on said channel coefficients.

45. The mobile communications system of claim 44 wherein said filter comprises a time-reversed conjugate channel filter.

46. The mobile communications system of claim 42 wherein said current set of unquantized wanted symbols includes only one wanted symbol.

47. The mobile communications system of claim 46 wherein said control combines a pair of successively received signal samples in a first combining way to obtain said current unquantized symbol and combines the same pair of samples in a second combining way to obtain a value of said interfering waveform.

48. The mobile communications system of claim 45 wherein said channel estimator determines said channel coefficients by correlating said received signal samples with known ones of said data symbols.

49. The mobile communications system of claim 48 wherein said known symbols include previously decoded symbols.

50. The mobile communications system of claim 42 wherein said receiver comprises a mobile terminal receiver.

51. The mobile communications system of claim 42 wherein said receiver comprises a base station receiver.